

**ATTACHMENT 8
ROG Emissions
Agricultural Pesticide Application
San Joaquin Valley**

Revised January 21, 2003

EMISSION INVENTORY SOURCE CATEGORY

Solvent Evaporation/Pesticides and Fertilizer

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION

530-530-322-50000 (83550) Agricultural Pesticides – Methyl Bromide

530-530-570-20000 (83568) Agricultural Pesticides – Non-Methyl Bromide

METHOD FOR CALCULATING EMISSIONS

Historical Emissions

Emissions in this source category come from the application of pesticides and are estimated by the Department of Pesticide Regulation (DPR). By law, farmers and crop growers file daily and monthly, field-specific and product-specific pesticide use reports (PUR) with DPR. Subsequently, DPR uses all applicable data from the PUR to estimate total organic gas (TOG) emissions. Not all gases react in the atmosphere to form ozone and the subset of TOG that do react are called reactive organic gases or ROG. DPR develops TOG emission estimates on an annual basis for those years for which PUR data are available (1990-2001).

To calculate TOG emissions, DPR applies measured or assigned emission potentials (EPs) to the applicable PUR data. The measured EPs for any pesticide formulation are derived from experimental data obtained by thermogravimetric analysis. Most measurements for the EPs occurred between 1994 and 1999. For those pesticide formulation classes where experimental data are unavailable, DPR assigns default values (EPs), using scientific judgement considering the chemical and physical principles involved.

In 2002, DPR revised their methodology for assigning default EPs and also corrected some other shortcomings in their historical emission inventory. A detailed discussion of the basis for these changes is provided in the attached December 16, 2002 memorandum from DPR. The revised methodology results in significantly lower pesticide emissions than previously estimated, especially for the year 1990.

Preliminary Draft – Do Not Cite or Quote

Forecasted Emissions

On an annual basis, DPR creates a database of monthly and annual base-year TOG emissions, which they then provide to the Air Resources Board (ARB). The ARB then estimates historical ROG emissions by applying speciation profiles to the TOG data provided by the DPR. The ARB also forecasts future year ROG pesticide emissions using the California Emission Forecasting System (CEFS), a sophisticated computer model.

Methodology

For most categories of the emission inventory, ARB uses CEFS to forecast future year emissions based on a single “base year” and appropriate temporal, growth, and control assumptions. In the case of State Implementation Plans (SIPs), the base year to be used for SIP future year forecasts is identified and agreed upon as part of the SIP planning process. For the upcoming San Joaquin Valley SIP, the agreed upon CEFS base year is 1999.

For pesticides, we recognize that forecasting future year emissions from a single base year (e.g. 1999) will not capture the recent (1999-2001) decline in pesticide emissions, as well as the inherent variability in pesticide emission due to weather and pest infestations. We therefore propose that pesticide emissions be forecast from an “adjusted base year” that reflects the average of the emissions for a five year period – the base year itself, as well as two years on either side of the base year. In the case of the SJV SIP, emissions for the years 1997 through 2001 would be averaged and that number applied to the year 1999 for pesticide forecasting purposes. ARB and DPR staff agree that the use of this five year average is the most technically defensible approach currently available to account for the weather and pest related variability in pesticide emissions.

Temporal Profiles

For modeling and planning purposes, it is important to know how emissions occur temporally (i.e. by month of the year, time of the day). For example, for the SJV ozone SIP, we are concerned only about those pesticide emissions that occur during the summer ozone season (assumed to be May through October). PUR data, which is reported to DPR on a daily basis, allow us to develop accurate monthly temporal profiles for each county in the SJV on a yearly basis. Table 1 shows the temporal profile assumed for the SJV for the 1999 base year based on PUR data from DPR. We currently assume pesticides are applied between the hours of 7:00 a.m. and 6:00 p.m seven days a week.

Table 1: Percent Distribution of Pesticide ROG Emissions in the SJV by Month*

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
9.7	5.4	7.2	8.3	10.2	10.9	10.8	7.1	6.5	10.8	7.0	6.1	100.0

* based on PUR data provided by DPR for the year 1999

Preliminary Draft – Do Not Cite or Quote

Growth Assumptions

ARB uses growth surrogates in the California Emission Forecasting System (CEFS) to predict future year pesticide emissions based on the DPR-provided base year data. For most categories of the inventory, we use growth surrogates developed as a result of a 1998 ARB research contract with Pechan and Associates. However, we recognize that the default growth surrogates selected by Pechan for some of the agricultural categories, including pesticides, may not be appropriate. The default growth surrogate suggested for agricultural pesticides is farm sector output (\$), however discussions with agricultural experts and DPR indicate that a more realistic surrogate is irrigated crop acreage.

After extensive analysis, ARB staff suggest that irrigated crop acreage projections developed by the Department of Water Resources (DWR) be used as the growth surrogate for agricultural pesticides. DWR's projected overall decline in SJV irrigated crop acreage of -0.2% per year agrees with historical data from the California Department of Food and Agriculture for the years 1992-2000, as well as anecdotal evidence provided through discussions with county agricultural commissioners and other agricultural experts. A more detailed discussion of the basis for the use of this proposed growth surrogate for pesticides, as well as some of the other agricultural categories, is provided in the accompanying document, *"Summary of Proposed Growth Factors for Agricultural Categories"* revision date January 21, 2003.

Control Assumptions

We explicitly account for the phase out of methyl bromide due to the Montreal Protocol. The Montreal Protocol requires developed countries, including the United States, to completely phase out methyl bromide use by the year 2005. However, certain applications and critical uses of methyl bromide are exempt from the Montreal Protocol. Based on discussions with DPR, we assume future year (2002 and beyond) emissions of agricultural methyl bromide will decline until the year 2010 when they will plateau at 1/3 the 1990 emissions of methyl bromide (to account for the continued use of methyl bromide for certain critical agricultural applications).

ROG EMISSIONS IN THE SAN JOAQUIN VALLEY

Table 2 and Figure 1 show the estimated summer ROG emissions from pesticide usage in the San Joaquin Valley for the years 1999 and 2010. The 1999 estimates reflect actual historical data provided by DPR. The 2010 estimates were developed by ARB using the CEFS model and the following assumptions:

- a) a 1999 base year that is adjusted to account for weather and pest infestation variability by taking the average of five years of historical DPR data (1997-2001);
- b) temporal profiles developed from actual monthly data from DPR's PUR database;
- c) growth surrogate of projected irrigated acreage developed by DWR and corroborated by historical acreage declines and discussions with agricultural experts;

Table 2: Summer Agricultural Pesticide ROG Emissions in the SJV (tons per day)

Category	1999	2010
Agricultural Pesticides – Methyl Bromide	5.3	2.0
Agricultural Pesticides – Non-Methyl Bromide	26.4	24.8
TOTAL	31.7	26.8**

* May – October

** Projected from adjusted 1999 base year of 29.8 tons per day

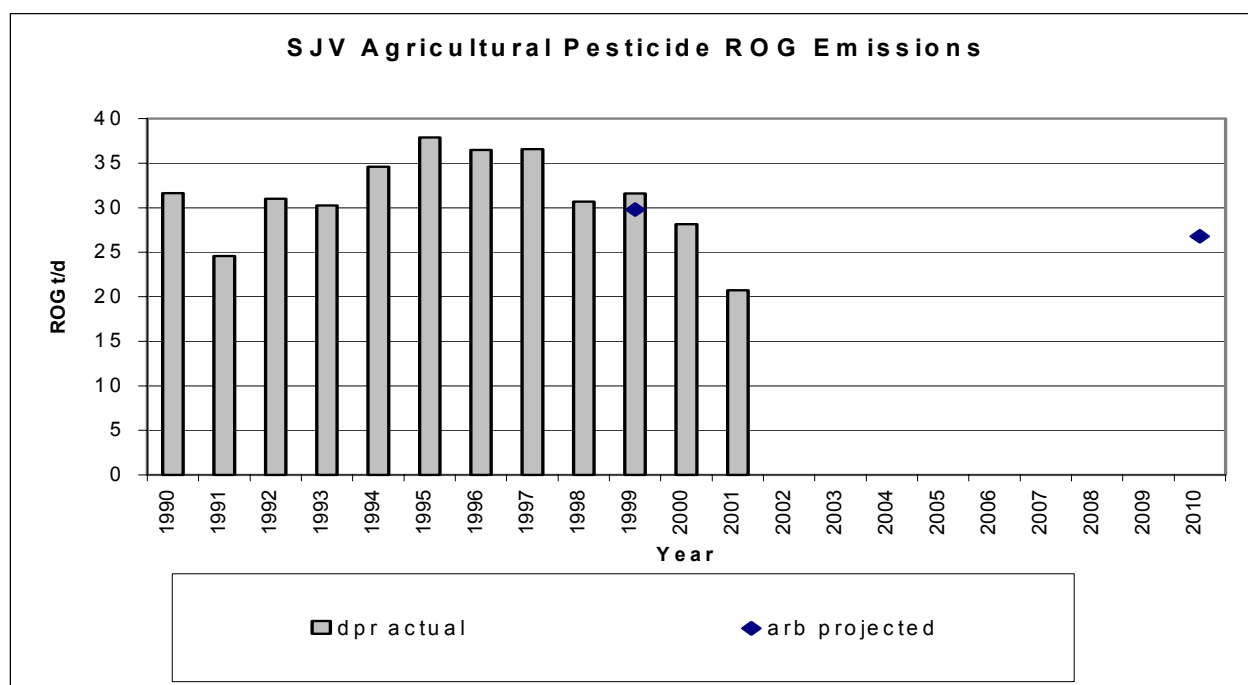


Figure 1: Historical and Projected SJV Summer Pesticide ROG Emissions

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